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Li et al.

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(54) **CHILD SAFETY SEAT**

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Related U.S. Application Data

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Foreign Application Priority Data

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(57) **ABSTRACT**

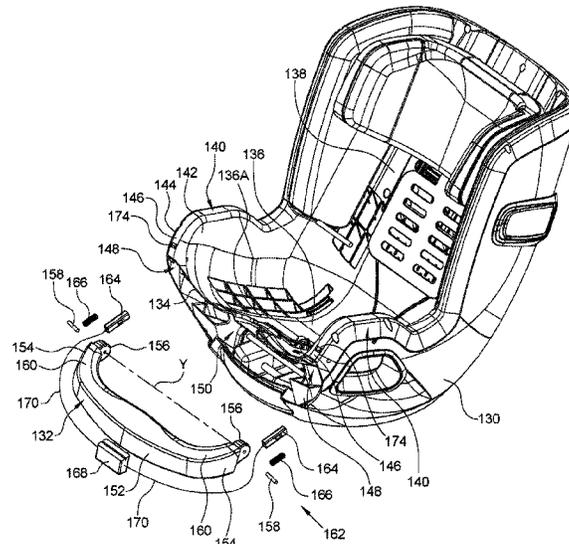
(51) **Int. Cl.**
B60N 2/80 (2018.01)
B60N 2/28 (2006.01)

A child safety seat includes a seat shell, a front end part rotatable relative to the seat shell between a retracted and a deployed position, and a latching mechanism for locking the front end part in the deployed position. The seat shell has a front end provided with an opening, and two sidewalls respectively protruding at a left and a right side of a seat portion. The front end part has a transversal portion extending along a width direction of the seat shell, and two side portions respectively connected pivotally with the two sidewalls of the seat shell via two pivot shafts spaced apart from each other along the width direction. The transversal portion of the front end part is stowed inside the opening of the seat shell in the retracted position, and extends outside the opening of the seat shell in the deployed position.

(52) **U.S. Cl.**
CPC **B60N 2/2839** (2013.01); **B60N 2/2821** (2013.01); **B60N 2/2851** (2013.01); **B60N 2/2869** (2013.01)

(58) **Field of Classification Search**
CPC ... B60N 2/2839; B60N 2/2821; B60N 2/2869
See application file for complete search history.

17 Claims, 10 Drawing Sheets



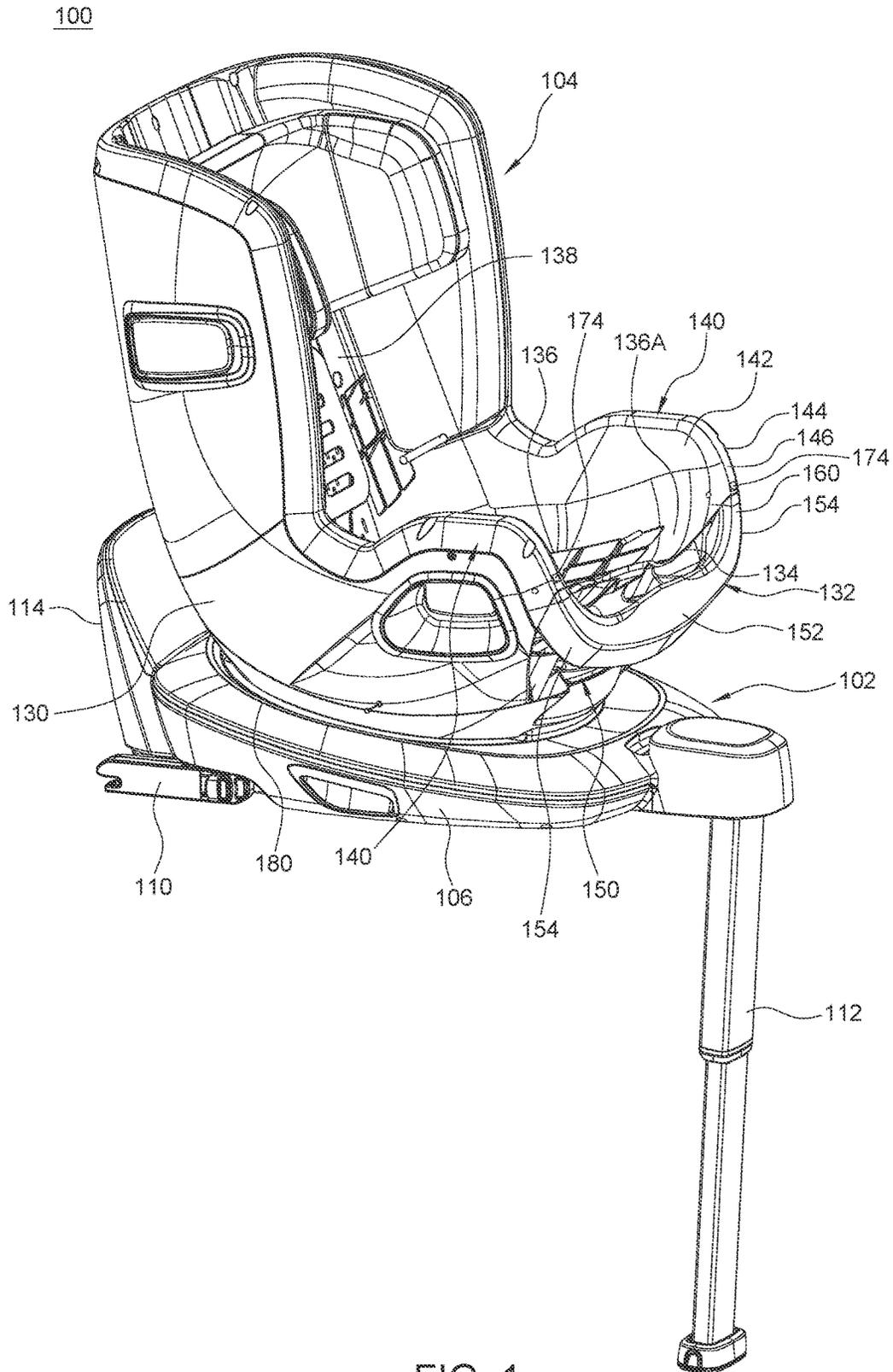


FIG. 1

100

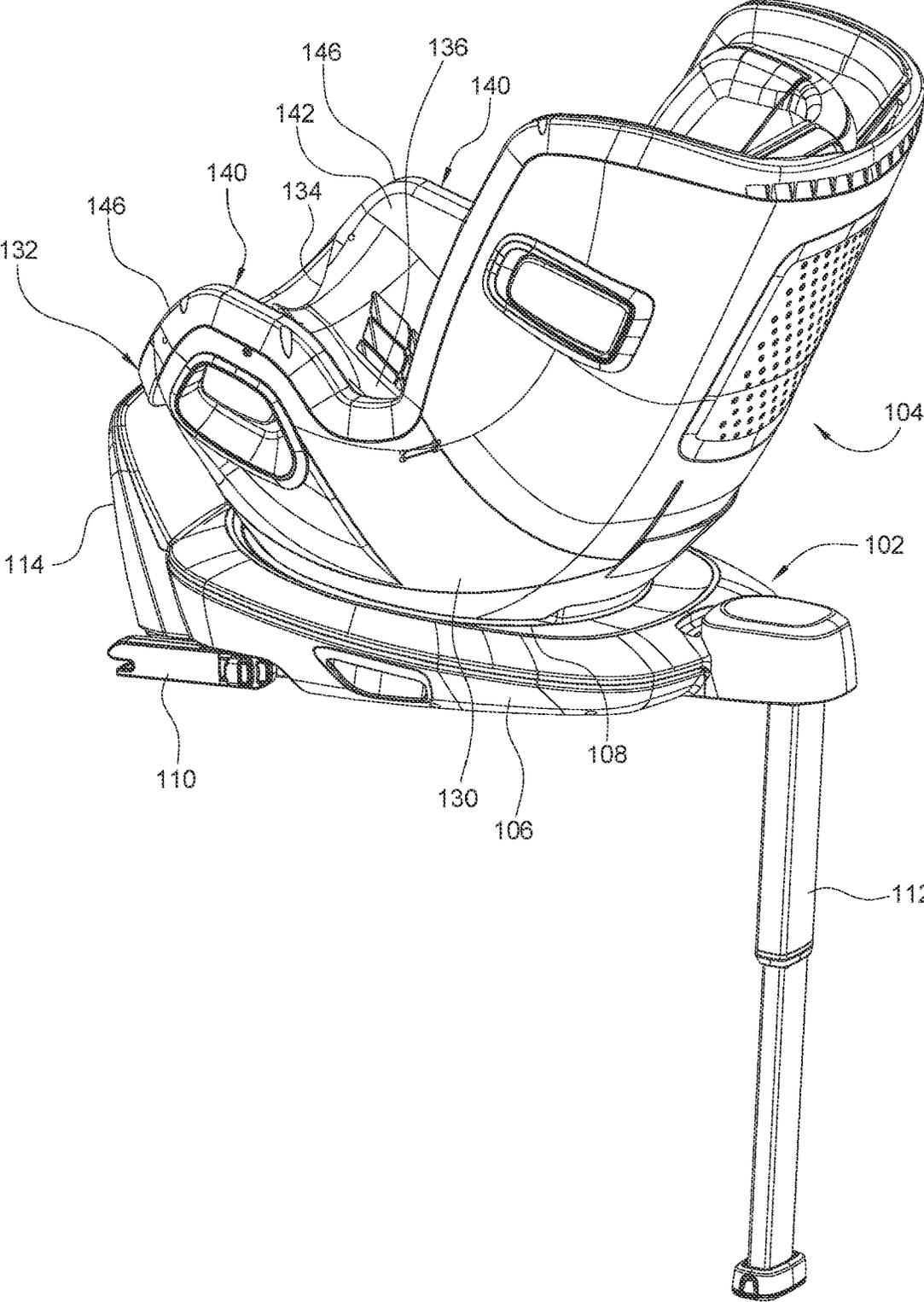


FIG. 2

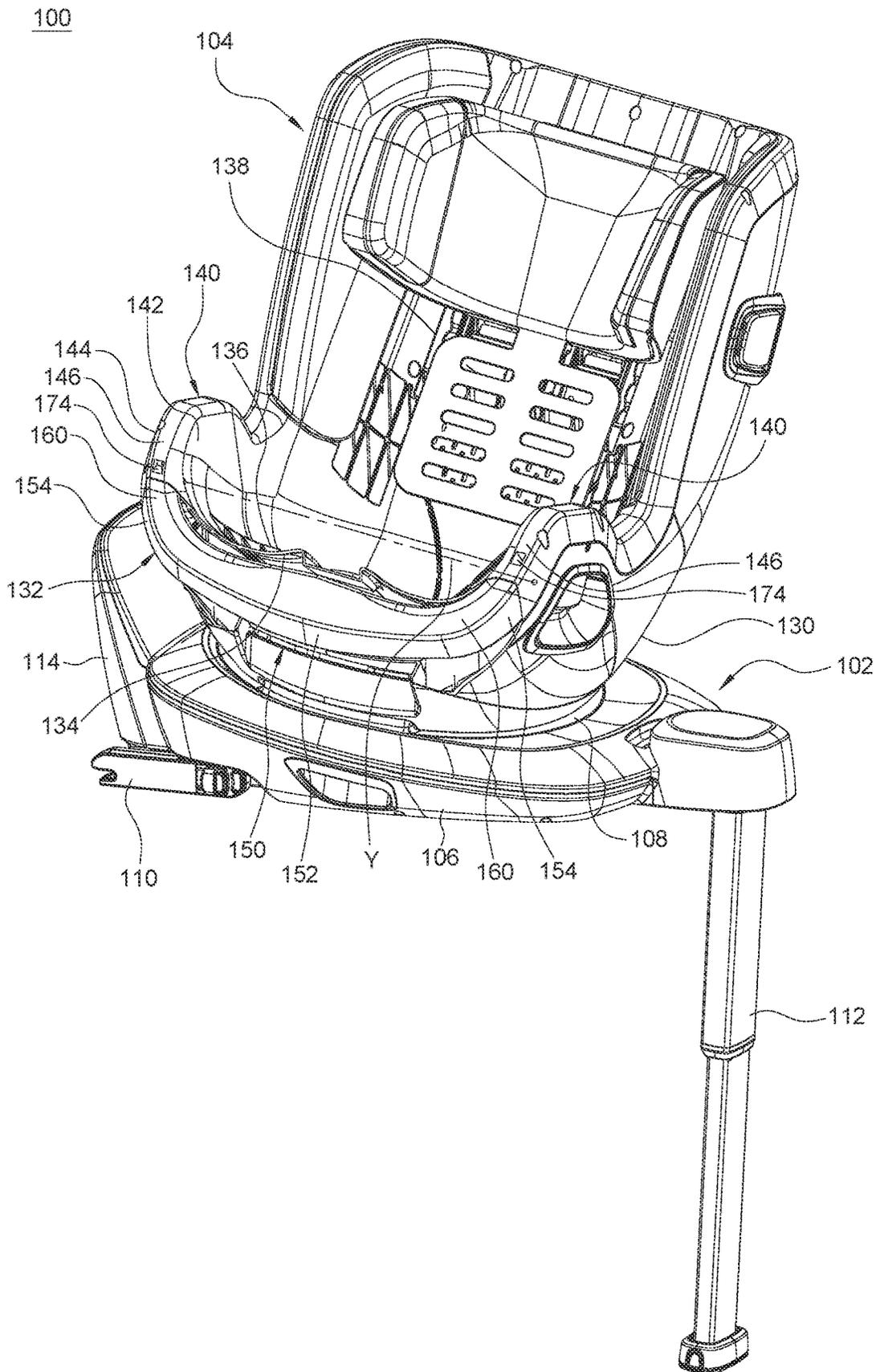


FIG. 3

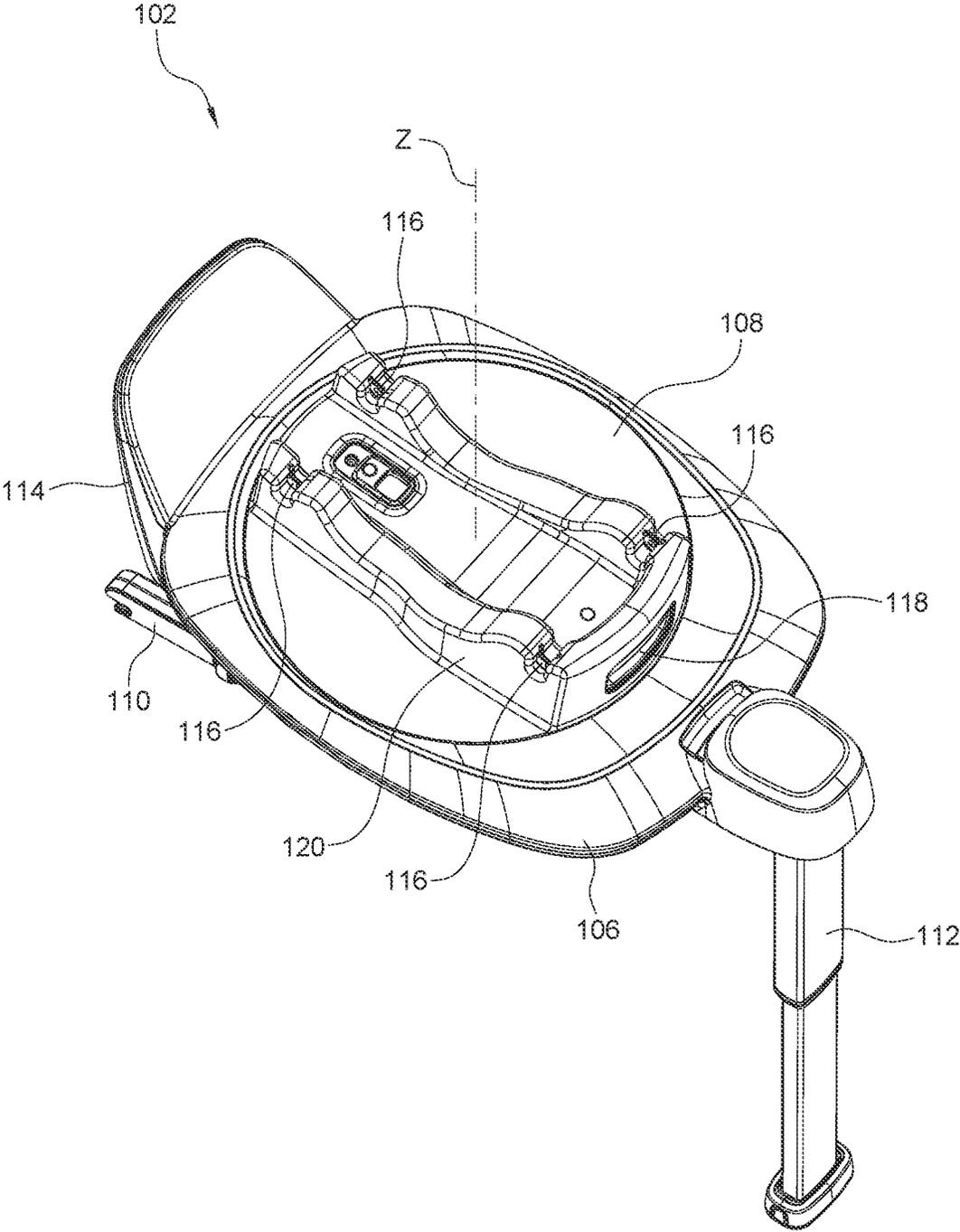


FIG. 4

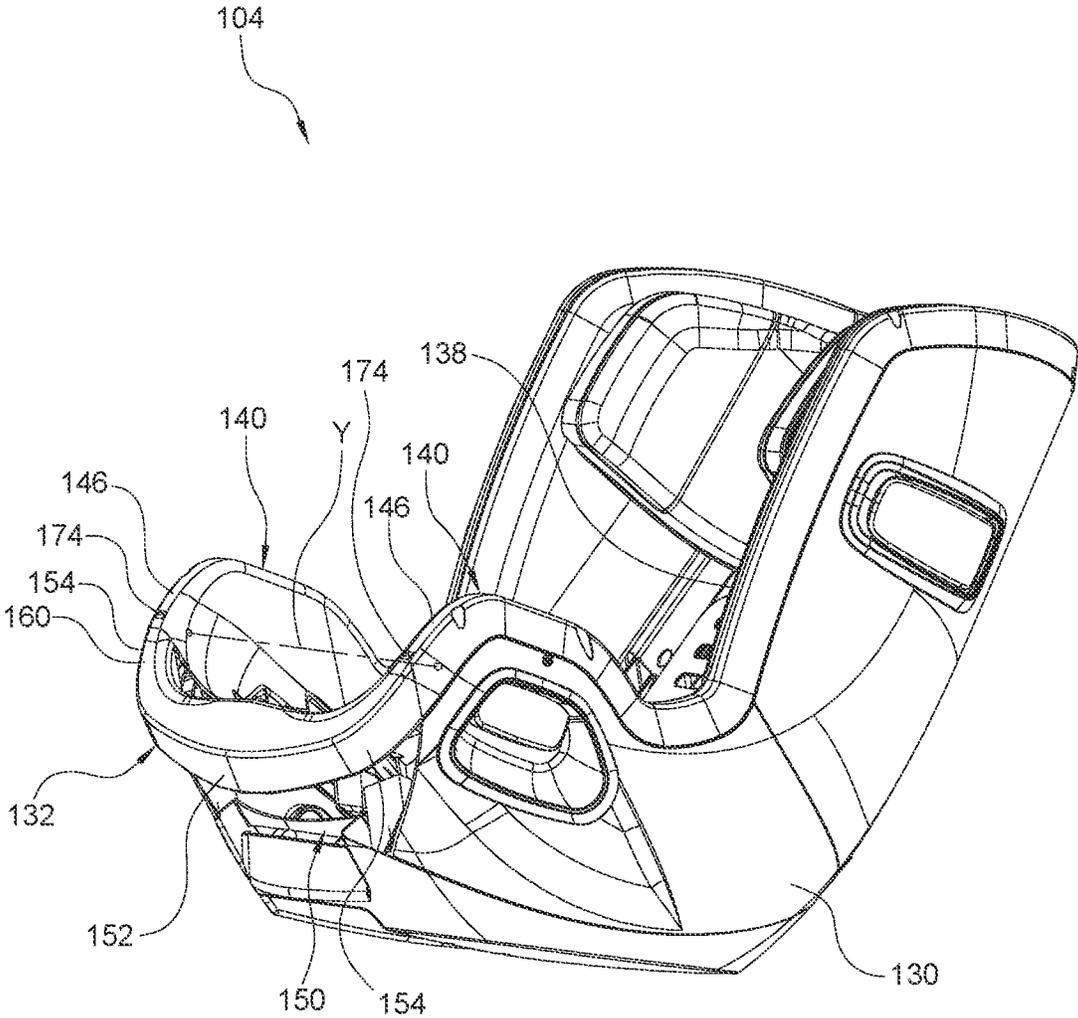


FIG. 5

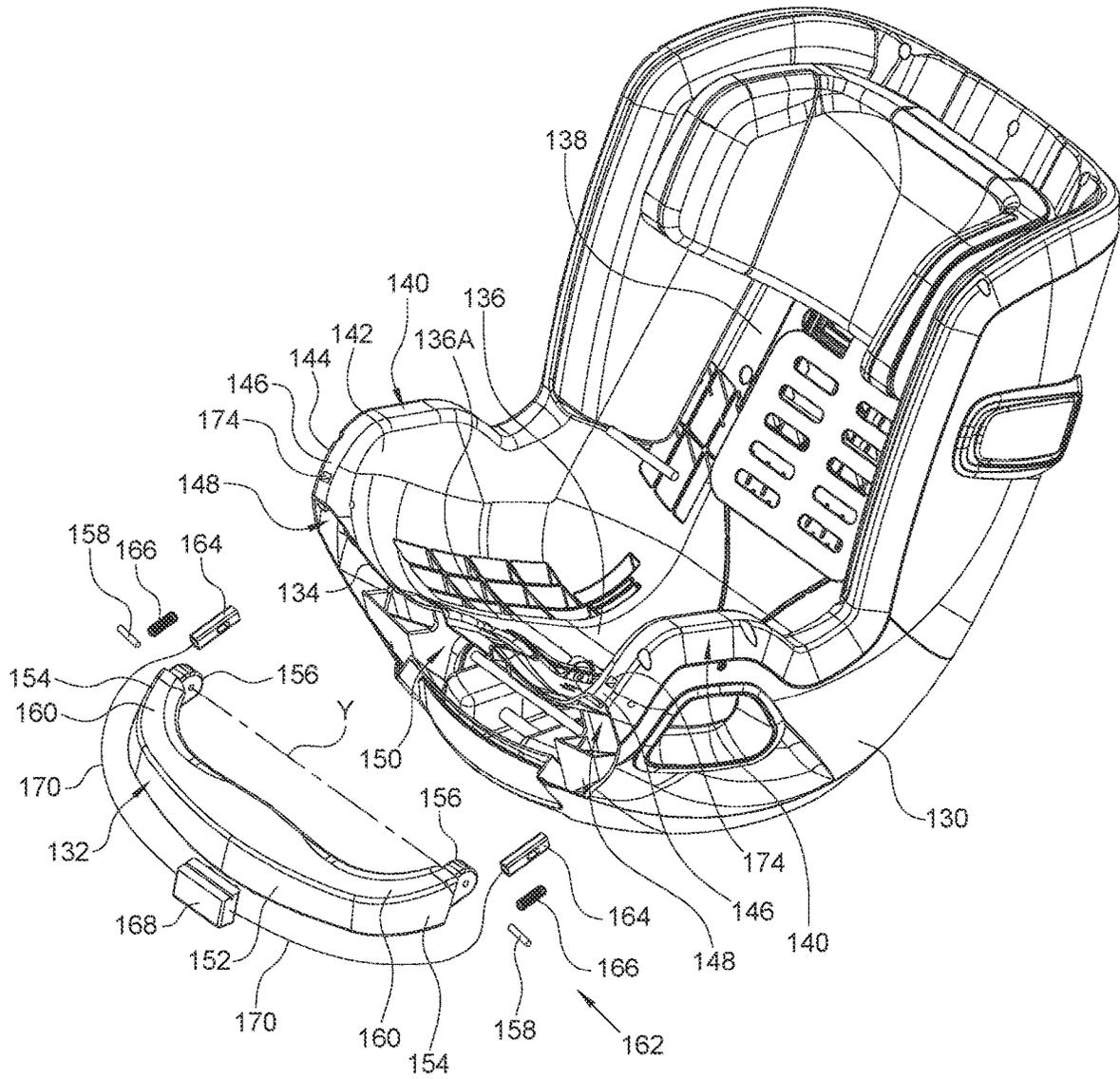


FIG. 6

100

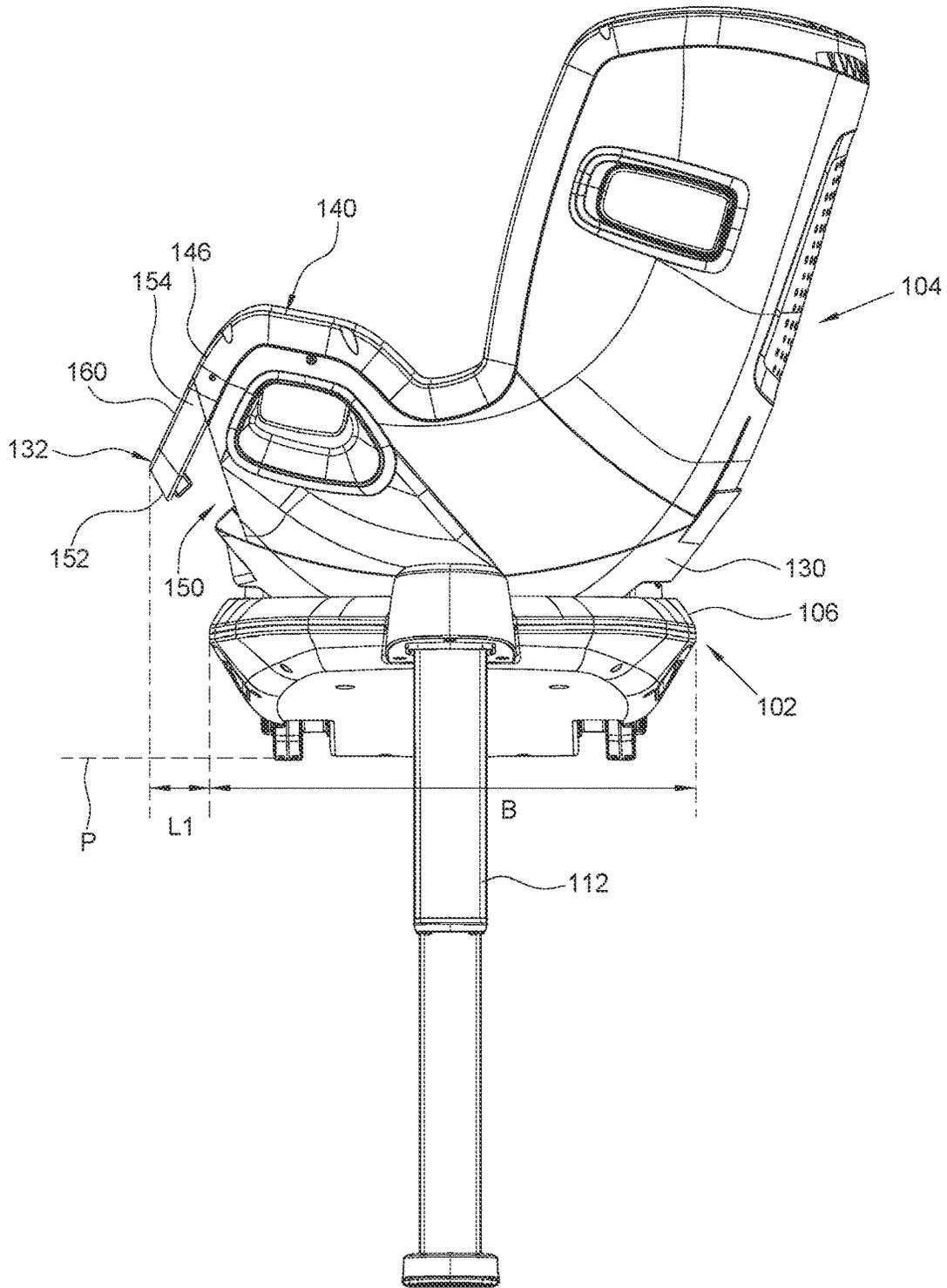


FIG. 9

100

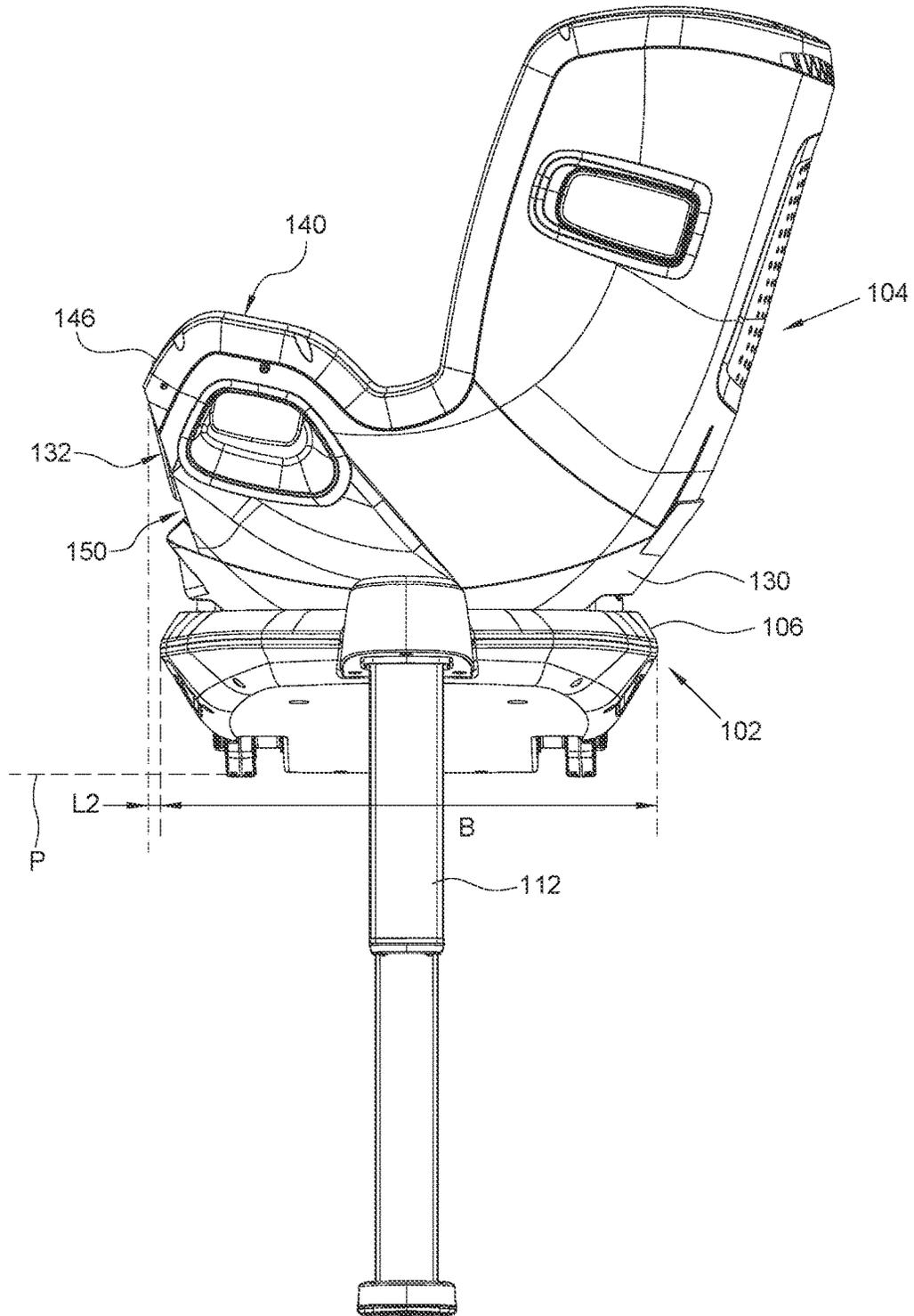


FIG. 10

1

CHILD SAFETY SEATCROSS-REFERENCE TO RELATED
APPLICATION(S)

This application is a continuation application of U.S. patent application Ser. No. 17/128,462 filed on Dec. 21, 2020, which claims priority to Chinese patent application no. 201911396862.X filed on Dec. 30, 2019.

BACKGROUND

1. Field of the Invention

The present invention relates to child safety seats.

2. Description of the Related Art

A child safety seat is typically used in an automobile vehicle to properly restrain a child in the event of accidental collision. In particular, it is well known that the installation of a child safety seat in a rearward facing position can offer better protection because it allows the collision energy to be dispersed across a larger area of the child's body (i.e., the child's torso and head). Accordingly, safety experts and car seat manufacturers usually recommend to seat a child in the rearward facing position till the age of 2 years. As the child grows older, the child safety seat may be installed in the forward facing position.

Some existing child safety seats allow to rotationally adjust a child seat between the rearward facing position and the forward facing position, and can further set the child seat in a sideways facing position for facilitating retrieval or placement of a child. However, because the support base of the child safety seat is attached on a vehicle seat at a location that is usually not distant from the vehicle door, the child seat may adversely collide against the vehicle door when it rotates toward the sideways facing position.

Therefore, there is a need for an improved child safety seat that allows flexible adjustment and address at least the foregoing issues.

SUMMARY

The present application describes a child safety seat that is more flexibly adjustable and can offer a more convenient use.

According to an embodiment, the child safety seat includes a seat shell, a front end part rotatable relative to the seat shell between a retracted position and a deployed position, and a latching mechanism for locking the front end part in the deployed position. The seat shell has a front end, a seat portion and two sidewalls, the front end having an opening, the two sidewalls respectively protruding at a left and a right side of the seat portion, and an interior space for receiving a child being defined at least partially between the two sidewalls. The retractable front end part has a transversal portion and two side portions connected with the transversal portion, the transversal portion extending along a width direction of the seat shell, and the two side portions being respectively connected pivotally with the two sidewalls of the seat shell via two pivot shafts spaced apart from each other along the width direction, whereby the front end part is rotatable relative to the seat shell between the retracted position and the deployed position, the transversal portion of the front end part being stowed and received at least partially inside the opening of the seat shell in the

2

retracted position, and the transversal portion of the front end part extending outside the opening of the seat shell in the deployed position.

5 BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view illustrating an embodiment of a child safety seat in a forward facing position;

FIG. 2 is a perspective view illustrating the child safety seat in a rearward facing position;

FIG. 3 is a perspective view illustrating the child safety seat in a sideways facing position;

FIG. 4 is a perspective view illustrating a support base of the child safety seat;

FIG. 5 is a perspective view illustrating a child seat of the child safety seat;

FIG. 6 is a partially exploded view illustrating some construction details of the child seat;

FIG. 7 is a perspective view illustrating some inner construction details of a seat shell of the child seat;

FIG. 8 is a perspective view illustrating the child seat with a front end part thereof in a retracted position;

FIG. 9 is a schematic view illustrating a configuration of the child safety seat where the seat shell is in the sideways facing position and the front end part in a deployed position; and

FIG. 10 is a schematic view illustrating a configuration of the child safety seat where the seat shell is in the sideways facing position and the front end part in the retracted position.

DETAILED DESCRIPTION OF THE
EMBODIMENTS

FIGS. 1-3 are perspective views illustrating an embodiment of a child safety seat **100** in different positions. Referring to FIGS. 1-3, the child safety seat **100** includes a support base **102**, and a child seat **104** disposed on the support base **102**. The support base **102** is adapted to be installed on a vehicle seat, and can provide stable support for the child safety seat **100**. The support base **102** can have a suitable structure for positioning the child seat **104** on the support base **102** in different orientations, such as a forward facing position shown in FIG. 1, a rearward facing position shown in FIG. 2, and a sideways facing position shown in FIG. 3.

In conjunction with FIGS. 1-3, FIG. 4 is a perspective view illustrating the support base **102**. Referring to FIGS. 1-4, according to an example of construction, the support base **102** can include a shell body **106**, a rotary platform **108**, two latch devices **110** and a support leg **112**. The shell body **106** can have an end forming a support panel **114** protruding upward. The two latch devices **110** can be assembled with the shell body **106**, and can be disposed at a left and a right side of the shell body **106** adjacent to the support panel **114**. The support base **102** can be installed on a vehicle seat with the support panel **114** adjacent to a seatback of the vehicle seat to provide support, and the two latch devices **110** can releasably engage with an anchor structure (e.g., ISOFIX anchor) provided in the vehicle to lock the support base **102** in place on the vehicle seat. The support leg **112** can be connected with the shell body **106** at an end thereof opposite to the end where are provided the latch devices **110**, and can extend downward from a bottom of the shell body **106**. In use, the support leg **112** extending from the bottom of the shell body **106** can contact against a floor of a vehicle in front of the vehicle seat on which the support base **102** is

installed, which can prevent adverse rotation of the child safety seat **100** toward the front of the vehicle.

The rotary platform **108** is pivotally connected with the shell body **106** about a pivot axis **Z**, and is adapted to receive the installation of the child seat **104**. The pivot axis **Z** can vertically pass through the rotary platform **108**, and can extend vertically or slightly tilted an angle (e.g., about 10 degrees to about 15 degrees) relative to a vertical axis. The rotary platform **108** can be provided with a plurality of latches **116** that are operatively connected with a release actuator **118**. When the child seat **104** is installed on the rotary platform **108**, the latches **116** can engage with the child seat **104** so that the child seat **104** and the rotary platform **108** are locked to each other. The release actuator **118** is operable to cause the latches **116** to move and disengage from the child seat **104** for removing the child seat **104** from the rotary platform **108**. According to an example of construction, the rotary platform **108** can have a protruding portion **120**, and four latches **116** can be provided on the protruding portion **120**.

After they are locked to each other, the child seat **104** and the rotary platform **108** can rotate in unison about the pivot axis **Z** relative to the shell body **106**, whereby the child seat **104** can be positioned in different orientations. For example, FIG. **1** illustrates the child seat **104** and the rotary platform **108** in a forward facing position, FIG. **2** illustrates the child seat **104** and the rotary platform **108** in a rearward facing position, and FIG. **3** illustrates the child seat **104** and the rotary platform **108** in a sideways facing position. When the child safety seat **100** is installed in the forward facing position on a vehicle seat, a child can sit on the child seat **104** facing a forward direction of the vehicle. When the child safety seat **100** is installed in the rearward facing position on a vehicle seat, a child can sit on the child seat **104** facing the seatback of the vehicle seat. When the child safety seat **100** is set in the sideways facing position, a child can sit on the child seat **104** facing a door of the vehicle. An angular displacement between the forward facing position and the sideways facing position can be about 90 degrees, and an angular displacement between the rearward facing position and the sideways facing position can also be about 90 degrees.

The support base **102** may include a plurality of latching parts (not shown) for locking the child seat **104** and the rotary platform **108** in any of the forward facing position, the rearward facing position and the sideways facing position. For example, the shell body **106** can be assembled with a plurality of latching parts operable to move upward for locking engagement with the rotary platform **108** and downward for disengaging from the rotary platform **108**.

In conjunction with FIGS. **1-4**, FIG. **5** is a perspective view illustrating the child seat **104**, and FIG. **6** is a partially exploded view illustrating some construction details of the child seat **104**. Referring to FIGS. **1-6**, the child seat **104** includes a seat shell **130**, and a retractable front end part **132**. The seat shell **130** can be installed on the support base **102**, e.g., by engaging a bottom structure of the seat shell **130** with the rotary platform **108** of the support base **102**. Once they are locked to each other, the seat shell **130** and the rotary platform **108** can rotate in unison relative to the shell body **106** so that the seat shell **130** can be positioned in different orientations, such as the forward facing position of FIG. **1**, the rearward facing position of FIG. **2**, and the sideways facing position of FIG. **3**.

The seat shell **130** can have a front end **134**, a seat portion **136**, a backrest portion **138** and two sidewalls **140**. The seat portion **136** can extend between the front end **134** and the

backrest portion **138**, and the two sidewalls **140** can respectively protrude upward from the seat portion **136** at a left and a right side thereof. An interior space of the seat shell **130** suitable for receiving a child can be defined at least partially between the two sidewalls **140**.

Each sidewall **140** can have a hollow structure, which can include two opposite sidewall surfaces **142** and **144**, a sidewall edge **146**, and an inner cavity **148** (better shown in FIGS. **6-8**) between the two sidewall surfaces **142** and **144**. More specifically, the sidewall surface **142** can face the interior space of the seat shell **130**, and the sidewall surface **144** can face an outer side of the seat shell **130**. The sidewall edge **146** can be located above the seat portion **136**, can be respectively connected with the two sidewall surfaces **142** and **144**, and can extend to the front end **134** of the seat shell **130** with an inclination so that a front portion of the sidewall edge **146** can face forward. The inner cavity **148** of the sidewall **140** can be delimited at least partially by the two sidewall surfaces **142** and **144** and the sidewall edge **146**.

Referring to FIGS. **5** and **6**, the front end **134** of the seat shell **130** can have an opening **150**, which can extend transversally relative to the seat shell **130** and can be respectively connected with the inner cavities **148** of the two sidewalls **140**. The front end part **132** can be pivotally connected with the seat shell **130**, whereby the front end part **132** can rotate relative to the seat shell **130** between a deployed position and a retracted position. In the deployed position, the front end part **132** can extend outside the opening **150**, and can project forward and downward. In the retracted position, the front end part **132** can be stowed and received at least partially inside the opening **150**. More specifically, the front end part **132** can have a transversal portion **152** and two side portions **154**, the transversal portion **152** extending along a width direction of the seat shell **130**. According to an example of construction, the transversal portion **152** can have a curved shape. The two side portions **154** can be respectively connected with the transversal portion **152**, and can bend from the transversal portion **152** symmetrical to each other. According to an example of construction, the front end part **132** including the transversal portion **152** and the two side portions **154** can be formed integrally as a single part.

The two side portions **154** of the front end part **132** are respectively connected pivotally with the two sidewalls **140** of the seat shell **130**, whereby the front end part **132** can rotate relative to the seat shell **130** between the deployed position and the retracted position. According to an example of construction, each side portion **154** may have a coupling end **156**, wherein the coupling end **156** can be fixedly connected with and protrude outward from the side portion **154**. The coupling ends **156** of the two side portions **154** can be respectively disposed inside the inner cavities **148** of the two sidewalls **140**, and can be respectively connected pivotally with the two sidewalls **140** via two pivot shafts **158**. The front end part **132** is thereby pivotally connected with the two sidewalls **140** about a pivot axis **Y** defined by the pivot shafts **158**, which can be located above the seat portion **136**. Each side portion **154** can have a width that is smaller than a width of the inner cavity **148** at a location adjacent to the sidewall **140**, whereby the side portion **154** can be retracted at least partially into the inner cavity **148** of the sidewall **140** when the front end part **132** is in the retracted position.

FIG. **5** illustrates the front end part **132** of the child seat **104** in the deployed position. In the deployed position, the transversal portion **152** of the front end part **132** can extend outside the opening **150** of the seat shell **130** and can be

5

positioned in front of the seat portion 136. Moreover, each side portion 154 of the front end part 132 can form a smooth profile extension relative to the sidewall 140 adjacent thereto that projects forward and downward from the opening 150. For example, each side portion 154 can have a front surface 160 that inclines forward and downward and forms a generally smooth profile extension from the sidewall edge 146 of the sidewall 140 adjacent thereto. The front end part 132 can provide support for the feet or legs of a child in the deployed position.

FIG. 8 illustrates the front end part 132 of the child seat 104 in the retracted position. In the retracted position, the transversal portion 152 of the front end part 132 can be stowed and received at least partially inside the opening 150 of the seat shell 130, and more particularly can be positioned in a hollow interior of the seat portion 136 below an upper surface 136A of the seat portion 136. Moreover, the two side portions 154 of the front end part 132 can be respectively received at least partially inside the inner cavities 148 of the two sidewalls 140, whereby the front surface 160 of each side portion 154 can form an angle with respect to the sidewall edge 146 of the sidewall 140 adjacent thereto.

In conjunction with FIGS. 5 and 6, FIG. 7 is a perspective view illustrating some inner construction details of the seat shell 130. For the sake of clarity, FIG. 7 omits the representation of the front end part 132. Referring to FIGS. 5-7, the child seat 104 can further include a latching mechanism 162 for locking the front end part 132 in the deployed position. The latching mechanism 162 can include two latches 164, two springs 166, a release actuator 168 and two cables 170. The two latches 164 can be respectively connected with the coupling ends 156 of the two side portions 154, and can move relative to the front end part 132 to engage with or disengage from the seat shell 130. For example, each latch 164 can engage with a locking opening 172 provided in the seat shell 130 for locking the front end part 132 in the deployed position, wherein the locking opening 172 can be exemplarily placed inside the inner cavity 148 of the sidewall 140. According to an example of construction, each latch 164 can be slidably connected with the coupling end 156 of the side portion 154 associated therewith, and can slide relative to the front end part 132 to engage with or disengage from the seat shell 130. The two springs 166 can be respectively connected with the two latches 164, and can respectively bias the two latches 164 to move for engaging with the seat shell 130. The release actuator 168 can be assembled with the front end part 132, and can be respectively connected with the two latches 164 via the two cables 170. According to an example of construction, the release actuator 168 can be provided on the transversal portion 152 of the front end part 132. The release actuator 168 is operable by a caregiver to urge the two latches 164 to move and disengage from the seat shell 130, whereby the front end part 132 can be unlocked for adjustment between the deployed position and the retracted position.

According to an embodiment, the latching mechanism 162 can further be configured to lock the front end part 132 in the retracted position. For example, each latch 164 can engage with another locking opening 174 provided in the seat shell 130 for locking the front end part 132 in the retracted position. Referring to FIGS. 1, 3, 5, 6 and 8, the locking opening 174 can be exemplarily provided on the sidewall edge 146.

In conjunction with FIGS. 1-8, FIG. 9 is a schematic view illustrating the child safety seat 100 with the seat shell 130 in the sideways facing position and the front end part 132 in

6

the deployed position, and FIG. 10 is a schematic view illustrating the child safety seat 100 with the seat shell 130 in the sideways facing position and the front end part 132 in the retracted position. Referring to FIG. 9, when the seat shell 130 is in the sideways facing position on the support base 102 and the front end part 132 in the deployed position, the front end part 132 can sideways protrude a distance L1 from the support base 102. More specifically, an image projection of the front end part 132 on a bottom plane P of the support base 102 can protrude the distance L1 from an image projection B of the support base 102 on the bottom plane P.

Referring to FIG. 10, when the seat shell 130 is in the sideways facing position on the support base 102 and the front end part 132 in the retracted position, the front end part 132 can sideways protrude a distance L2 from the support base 102, wherein the distance L2 can be substantially smaller than the distance L1 because the transversal portion 152 of the front end part 132 can be generally positioned in the hollow interior of the seat portion 136. According to an example of construction, the distance L2 can be equal to or smaller than about half the distance L1. According to another example of construction, an image projection of the front end part 132 on the bottom plane P of the support base 102 can be within the boundary of the image projection B of the support base 102 on the bottom plane P when the seat shell 130 is in the sideways facing position on the support base 102 and the front end part 132 in the retracted position. Accordingly, when the child safety seat 100 is used inside a vehicle, a caregiver can first adjust the front end part 132 to the retracted position, and then rotate the child seat 104 from the forward or rearward facing position to the sideways facing position for retrieving a child from the child seat 104 or placing a child on the child seat 104. With the front end part 132 in the retracted position, collision between the child seat 104 (in particular the front end part 132 thereof) and a door of the vehicle can be prevented as the child seat 104 rotates to the sideways facing position.

Advantages of the structures described herein include the ability to provide a child safety seat that is adjustable to different orientations as needed and has a front end part retractable to prevent undesirable interference with a vehicle environment during the adjustment of the child safety seat. Accordingly, the child safety seat can be more flexible and convenient in use.

Realization of the child safety seat has been described in the context of particular embodiments. These embodiments are meant to be illustrative and not limiting. Many variations, modifications, additions, and improvements are possible. These and other variations, modifications, additions, and improvements may fall within the scope of the inventions as defined in the claims that follow.

What is claimed is:

1. A child safety seat comprising:

- a seat shell having a front end, a seat portion and two sidewalls, the front end having an opening, the two sidewalls respectively protruding at a left and a right side of the seat portion, and an interior space for receiving a child being defined at least partially between the two sidewalls, wherein each of the two sidewalls has two opposite sidewall surfaces that respectively face the interior space of the seat shell and an outer side of the seat shell, and an inner cavity delimited at least partially between the two sidewall surfaces;
- a retractable front end part, having a transversal portion and two side portions connected with the transversal

portion, the transversal portion extending along a width direction of the seat shell, and the two side portions being respectively connected pivotally with the two sidewalls of the seat shell via two pivot shafts spaced apart from each other along the width direction, each of the two side portions being received at least partially inside the inner cavity between the two opposite sidewall surfaces of a corresponding one of the two sidewalls, whereby the front end part is rotatable relative to the seat shell between a retracted position and a deployed position, the transversal portion of the front end part being stowed and received at least partially inside the opening of the seat shell in the retracted position, and the transversal portion of the front end part extending outside the opening of the seat shell in the deployed position; and

a latching mechanism for locking the front end part in the deployed position.

2. The child safety seat according to claim 1, wherein the front end part including the transversal portion and the two side portions is formed integrally as a single part.

3. The child safety seat according to claim 1, wherein the two side portions bend from the transversal portion symmetrical to each other.

4. The child safety seat according to claim 1, wherein the two side portions of the front end part respectively project forward and downward from the two sidewalls in the deployed position.

5. The child safety seat according to claim 1, wherein the front end part is pivotally connected with the two sidewalls about a pivot axis that is located above the seat portion.

6. The child safety seat according to claim 1, wherein each of the two sidewalls further has a sidewall edge connected with the two sidewall surfaces thereof, the inner cavity of each of the two sidewalls being delimited at least partially by the two sidewall surfaces and the sidewall edge thereof.

7. The child safety seat according to claim 6, wherein each of the two side portions has a front surface that inclines forward and downward and forms a profile extension from the sidewall edge of the sidewall adjacent thereto in the deployed position, the front surface forming an angle with respect to the sidewall edge of the sidewall adjacent thereto in the retracted position.

8. The child safety seat according to claim 1, wherein each of the two side portions has a coupling end, the coupling ends of the two side portions being respectively disposed inside the inner cavities of the two sidewalls and respectively connected pivotally with the two sidewalls via the two pivot shafts.

9. The child safety seat according to claim 8, wherein the latching mechanism includes two latches respectively connected with the coupling ends of the two side portions, the two latches being movable relative to the front end part for engaging with or disengaging from the seat shell.

10. The child safety seat according to claim 9, wherein the two latches are respectively connected slidably with the coupling ends of the two side portions, whereby the two latches are slidable relative to the front end part for engaging with or disengaging from the seat shell.

11. The child safety seat according to claim 9, wherein the latching mechanism further includes two springs respectively connected with the two latches, the two springs respectively biasing the two latches to move for engaging with the seat shell.

12. The child safety seat according to claim 9, wherein the latching mechanism further includes a release actuator and two cables, the release actuator being assembled with the front end part and respectively connected with the two latches via the two cables, the release actuator being operable to urge the two latches to move and disengage from the seat shell.

13. The child safety seat according to claim 12, wherein the release actuator is provided on the transversal portion of the front end part.

14. The child safety seat according to claim 1, further comprising a support base adapted to be installed on a vehicle seat, the seat shell being positionable on the support base.

15. The child safety seat according to claim 14, wherein the support base includes a shell body and a rotary platform pivotally connected with each other, the seat shell and the rotary platform being rotatable in unison relative to the shell body so that the seat shell is positionable in different orientations, including a forward facing position, a rearward facing position and a sideways facing position.

16. The child safety seat according to claim 15, wherein the front end part sideways protrudes a first distance from the support base when the seat shell is in the sideways facing position on the support base and the front end part is in the deployed position, and the front end part sideways protrudes a second distance from the support base when the seat shell is in the sideways facing position on the support base and the front end part is in the retracted position, the second distance being equal to or smaller than the first distance.

17. The child safety seat according to claim 16, wherein the second distance is smaller than about half the first distance.

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